The Interagency Steering Committee on Multimedia Environmental Modeling (ISCMEM)
2016 Annual Meeting

December 14, 2016

Working Group 4 - Surface Water and Watershed Water Quality Modeling

Technical Focus of Workgroup

The focus of this workgroup is to collaborate on the development of surface water and watershed water quality models to simulate nutrient, associated material (nitrogen, phosphorus, carbon, sediment, organic matter, pesticides, and fecal coliform bacterial), contaminant transport, uptake, loss, transformation, and recycling, and vegetation dynamics and uptake.

The models are being formulated so they can be extended beyond the range of calibration, making them useful for analysis of future scenarios such as restoration efforts and implementation of BMPs. Also, the models will be available to and usable by a broad audience.

Workgroup Members

AGENCY	MODELERS	Contact Information
Department of Defense (ERDC)	Billy Johnson – Vicksburg, MS Todd Steissberg – Davis, CA	billy.e.johnson@usace.army.mil todd.e.steissberg@usace.army.mil
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U.S. Bureau of Reclamation (USBR)	Blair Greimann – Denver, CO	bgreimann@usbr.gov
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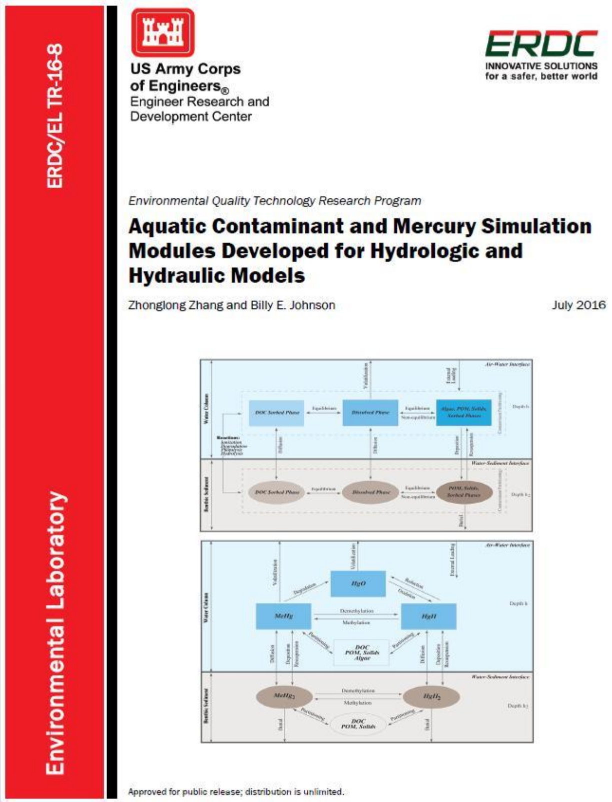
Working Group 4 Webinar Series

ISCMEM Group IV - Webinar Series					
#	Webinar Title	Presenter	Affliation	Date	Time (Central)
1	Integration of Water Quality Modules into HEC Software	Todd Steissberg and Zhonglong Zhang	HEC and ERDC-EL	4/13/2016	1:00 PM
2	Multi-Scale Modeling of Watershed System Function and Dynamics	David Lesmes	Department of Energy	7/27/2016	1:00 PM
3	Overview of SRH-1D and SRH-2D Hydraulic, Sediment Transport, and Vegetation Models	Blair Greimann	U.S. Bureau of Reclamation	10/25/2016	1:00 PM
4	Overview of Agricultural Non-Point Source Pollution Model (AGNPS)	Ron Bingner	USDA - Agricultural Research Service	2nd Qtr FY17	1:00 PM

More Topics being discussed for future webinars

Joint Collaboration – USACE-USBR Mercury Modeling



An Integrated Modeling Tool to Assess Mercury Transport and Transformation Processes at Reservoirs

Project ID: 3425
Principal Investigator: Yong Lai
Research Topic: Water Quality
Funded Fiscal Years: 2015
Keywords: methylmercury control, water quality in reservoir, integrated modeling tool for mercury

Research Question

This research is an outcome of the 2014 USBR-USACE Research Workshop. An urgent research need was raised by Jobaid Kabir (MP Region, Reclamation) about mercury control at Reclamation reservoirs; and USACE has expressed strong interest in collaboration with Reclamation to incorporate USACE's water quality and mercury modules into Reclamation SRH-2D model. A multi-agency team is thus formed to adress the mercury issue leading to this reserach proposal.

Mercury is a toxic metal that is found both naturally and as an introduced contaminant in an aquatic environment. Methylmercury (MeHg) is the most toxic form. Presence of MeHg in many western reservoirs has led to the identification of state-level water quality standards and control programs, e.g., in California, Oregon and Washington. Reclamation will be required to comply with these new standards and they need to develop and implement various reservoir mercury management practices. However, there is currently no standard for such management practices. Research has indicated that each aquatic environment should be evaluated individually because similar conditions in separate reservoirs have been shown to produce different rates of mercury bioaccumulation. Untested management practices may be ineffective at providing the appropriate level of mitigation and can be cost prohibitive for large reservoir operators at Reclamation.

In this study, we propose to develop an integrated mercury transport and transformation modeling tool, involving hydrodynamic, sediment and water quality, to answer the following questions:

(1) Can a reliable integrated mercury dynamic model be developed that will allow Reclamation to assess the feasibility and effectiveness of mercury management measures in its facilities?
(2) What factors (temperature, nutrients, organisms, etc.) control the MeHg process?
(3) What are the factors that govern the mercury cycle in a particular reservoir environment?

Need and Benefit

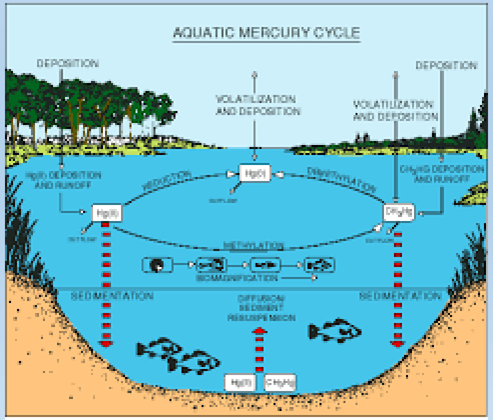
Methylmercury in reservoirs is becoming an urgent water quality issue for Reclamation since state water quality regulatory agencies have established water quality standards for mercury in many states such as California, Oregon, Washington, Colorado, and many other states. Enforcement of the mercury water quality standard varies by state but Reclamation will be required to comply with the new standards. Some states choose to mandate management practices while others choose collaborative approaches. The State of California, for example, has performed an extensive research and is using the research to develop and encourage mercury management practices as a part of the TMDL development process. A number of Reclamation reservoirs have been on the list in California which need future actions for mercury mitigatyion.

A number of current research projects have demonstrated that some management practices may lead to MeHg reduction, but that there is no standard for reservoir environment. Research has also indicated that each aquatic environment should be evaluated individually; similar conditions in separate reservoirs have been shown to produce different rates of mercury bioaccumulation. On the one hand, current management practices can be cost prohibitive for Reclamation and other large reservoir operators within the state. On the other hand, even if they are implemented, the success of providing the appropriate level of mitigation in Reclamation facilities is uncertain since these practices have not been tested and researched.

There is an urgent need at the Reclamation-wide level to have access to a reliable mercury model that may be used to assess the feasibility of mercury management measures at each specfic Reclamation reservoirs. Without a means to evaluate reservoir mercury processes Reclamation may be forced to implement unreasonable mercury control practices. In the Mid-Pacific Region, for example, the need has been identified to develop a framework for decision making related to mercury management in reservoirs. This research will assist in finding the most efficient and cost effective solutions. At the present, a reliable modeling tool to assess methylmercury processes is the best alternative. A modeling tool may benefit the reservoir managers and operators to answer the question of whether reservoir operational changes can be developed to reduce mercury methylation.

Contributing Partners

Contact the Principal Investigator for information about partners.



Folsom Reservoir – Folsom, CA

Joint Collaboration – USACE-EPA Military Training Range Fate and Transport

SERDP
DOD • EPA • DOE
ESTCP
DoD's Environmental Research Programs

Field Demonstration and Validation of the Training Range Environmental Evaluation and Characterization System (TREECS) and Environmental Fate Simulator (EFS) for the Risk Assessment of Contaminants on DoD Ranges

ER-201435

Objective

This project will demonstrate and validate the integrated Training Range Environmental Evaluation and Characterization System (TREECS™) and Environmental Fate Simulator (EFS) modeling system to show that its performance is consistent, reliable, and cost effective and that TREECS™/EFS advances the ability to reliably quantify the potential of environmental risks from munitions constituents (MCs) on Department of Defense (DoD) training and testing ranges. The scope of the project includes identifying active DoD training ranges, determining the nature and extent of MCs, analyzing potentially complex exposure pathways, validating TREECS™/EFS to estimate risk from exposure to MCs, developing user guidance in applying the TREECS™/EFS for environmental risk assessment, and providing full production transition and technology transfer for environmental specialists and range managers.

Benefits

The TREECS™/EFS modeling system will allow DoD training range managers to rapidly assess off-site migration problems due to contaminant fate and transport for routine and emerging contaminants as well as provide mitigation Green Range Best Management Practice (BMP) alternatives where concentrations exceed human and ecological health benchmarks. (Anticipated Project Completion - 2017)

Technology Description

TREECS™ consists of time-varying contaminant fate/transport models for soil, vadose zone, groundwater, and surface water to forecast MC export from ranges and resulting concentrations in each medium. The soil model simulates a layer of surface soil that has a constituent concentration that varies with time but is fully mixed over a given area of interest. It accounts for MC transport and transformations due to rain induced erosion, surface runoff, leaching, degradation, and volatilization processes. The constituent is assumed to exist in solid and nonsolid (dissolved) phases. The nonsolid phase mass exists in equilibrium distributed as dissolved in water within the water filled soil pore spaces, as adsorbed from water to soil particles, and as a vapor in air within the air filled pore spaces. The soil model computes time-varying soil concentrations and mass export fluxes for erosion, rainfall extracted runoff, and infiltration. The vadose zone model uses the infiltration, or leached mass influx rate, to compute the time-varying mass flux entering the groundwater. The groundwater model uses the vadose zone mass flux and the receptor location to compute the time-varying groundwater concentration of the MCs at the receptor location. The surface water models use the time-varying mass influx imports to compute the time-varying surface water and sediment concentrations of the MCs.

The prototype EFS consists of four major components: (1) Chemical Editor that allows for the entry of the chemical of interest through either provision of the common name, smiles string notation, CAS number, or chemical structure; (2) Reaction Pathway Simulator, which based on description of the environmental conditions (e.g., anaerobic vs. aerobic) will provide the major transformation products based on the execution of reaction libraries for abiotic reduction, hydrolysis, and aerobic biotransformation; (3) Physicochemical Properties Calculator, which through access to SPARC (SPARC Performs Automated Reasoning in Chemistry), EPI (Estimation Program Interface) Suite, and ChemAxon's plug-in calculators, will provide the necessary physicochemical properties required for predicting environmental concentrations; and (4) Structure-based Database, which will store the physicochemical properties for both the parent and predicted transformation products as a function of environmental conditions.